

MACKENZIE VALLEY PIPELINE INQUIRY

PHASE I

Operations and Maintenance Plans for the Proposed Pipeline

APPENDIX A

Witness Resumes: L.G. Hurd
D.E. Fielder
M.E. Carlson

WITNESS RESUME

NAME

Lee Gordon Hurd

PRESENT POSITION

Director, Planning & Special Studies
Canadian Arctic Gas Study Limited

EDUCATION

Graduated from the University of Alberta in 1952 with the degree of Bachelor of Science in Chemical Engineering.

PROFESSIONAL AFFILIATIONS

The Association of Professional Engineers, Geologists
and Geophysicists of Alberta

The Association of Professional Engineers of British
Columbia

The Association of Professional Engineers of Yukon
Territory

PROFESSIONAL EXPERIENCE

1952 - 1957:

Employed by a natural gas company operating in central Alberta. The company owned and operated several gas wells, a processing plant and about seventy miles of gathering and transmission pipelines. For three of the five years, I was Manager of the company responsible for its ongoing construction programs and its operations.

1957 - 1959:

Senior Design Engineer with Westcoast Transmission Company Limited in British Columbia. That company owned and operated about 1000 miles of gathering and transmission pipelines, including compressor stations, and a processing plant. My responsibilities included the design of facility additions, construction management and assisting with the development and implementation of the company's operating practices.

1960 - 1961:

Project Engineer with Canadian Bechtel Limited in Calgary, Canada. I was responsible during this time for the design of the Alberta Gas Trunk Line Company Foothills Division pipeline and worked closely with the client's engineering and operating staff throughout the project. The project consisted of several hundred miles of gathering and transmission pipelines, ranging in diameter up to 36 inches. It carries gas for export from Alberta to markets in the U.S. Pacific Northwest and California.

1962 - 1970:

Employed by Alberta and Southern Gas Co. Ltd., and Alberta Natural Gas Company. The latter company owns and operates the 106-mile segment of the "Alberta-California" pipeline located in southeast British Columbia. During this time, I was responsible for the gas operations of Alberta & Southern (a "shipper" in the systems of the Alberta Gas Trunk Line Company and of Alberta Natural Gas and a "seller" to Pacific Gas Transmission Company at the international border), and in this capacity, I worked closely with the operations department of Alberta and Southern and of Pacific Gas Transmission Company. I was also responsible for the design of facilities expansions on the Alberta Natural Gas Company System. I held several positions with these companies, ending with Vice President, Planning and Development.

1970 - Present:

Employed by Canadian Arctic Gas Study Limited and one of the predecessor groups to that company (the Northwest Project Study Group, for which I was Project Manager). During this time, I have been responsible for a variety of studies, overall project coordinating functions and preparing and coordinating the preparation of exhibit materials.

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March 25, 1975

D. E. FIELDER, P. Eng.

1. Canadian citizen.
2. Graduated from the University of Oklahoma in 1957.
3. Career in pipeline engineering extends from 1958 to the present:
 - a. Eight years with Rangeland Pipeline Division of HBOG 1958-1965.
 - b. Six years with Peace Pipeline Co. Ltd. 1965-1971.
 - c. Three and one half years with Arctic Gas starting with Gas Arctic Systems in September, 1971. Am currently Manager of the Operations and Maintenance Department and prior to that was Manager, Pipeline Design.
- 4.(a) Member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta.
 - (b) Represents Arctic Gas on the CSA Z 184 Code Committee and two subcommittees---Transmission and Northern.

Q. Have you had any recent exposure to Soviet pipeline design, construction, and operating techniques with special emphasis on arctic and permafrost problems?

A. Yes. During the period from November 19 through December 2, 1974, I, accompanied by several other Canadians with varied interests (but generally pertaining to the gas industry), visited the Soviet Union. The visit was organized and sponsored by the Federal Department of Industry, Trade and Commerce and formed part of the Canadian contribution to an organized exchange of technology relating to the gas industry.

You might be interested to learn that during a reciprocal visit I acted as host to a group of Soviet experts on Friday, March 21. During that meeting a member of Dr. Clark's staff described to the Soviets the status of our research in the field of frost heave, and answered many questions they posed (mostly related to foundation design in ice-rich permafrost).

During my visit to Russia, meetings were held with various senior members of the USSR Gas Ministry and other associated Ministries in Moscow, Donetsk in the Ukraine, Tuymen and Nadym in western and northwestern Siberia.

The purpose of the questions posed by we Canadians was to determine the manner in which the Soviets deal with problems relating to the development of gas fields, i.e., drilling, construction and operation of gas gathering systems and treatment plants, and the design, construction and operation of gas pipeline and compressor stations, all in permafrost areas.

Q. Why were you selected to participate in this visit?

A. At the time the final selection of Canadian delegates was made, I was Manager of the Pipeline Design section of Arctic Gas. I was both interested and had an obvious need to learn as much as possible respecting Soviet permafrost engineering as it applies to the design, construction, and operation of gas pipelines.

Q. Will you tell us briefly what you learned?

A. Not a great deal! We were all disappointed to learn after our arrival in Moscow that while the area we were to visit in the Soviet arctic is described as an area of discontinuous permafrost that most of the pipeline and all above ground facilities were located deliberately in areas which contained little or no permafrost. The area I refer to is the southern portion of the Medverzhye Gas Field which is located in Northwestern Siberia approximately 1200 km. (746 miles) north of the City of Tuymen in the Province of Tuymen. It is approximately 50 km. (31 miles) from the Arctic Ocean. The pipelines servicing that area run generally southwest from Medverzhye serving markets in the Urals and in Moscow. Both buried and grade (bermed) construction techniques were utilized.

Q. How was it possible for the Soviets to avoid permafrost terrain problems when locating their pipelines and above ground facilities in an area of discontinuous permafrost?

A. Avoidance of permafrost areas along the pipeline route was accomplished by locating all facilities as much as

possible in river flood plains which do not contain permafrost. Between river valleys the pipelines were located along relatively high ridges of well-drained permafrost. The area is predominantly sand, which was, we were told, easily trenched and caused few problems.

The area is very old, never--we were told, having been glaciated. River valleys were very wide--up to 13 km. (8 miles)--with the wetted banks being only 3-4 meters (10 - 13 feet) in height. Secondary banks had very gentle slopes and the relief in the area appeared from the air to be less than 30 meters (98 feet). As mentioned earlier the soil was mostly sand and was well drained in the higher areas.

Problems with permafrost there are so minimal that the lines are operated at a temperature of $+3^{\circ}\text{C}$ (37°F) to $+40^{\circ}\text{C}$ (104°F), (well above the melting temperature of ice.)

- Q. Did you discover anything relevant during your visits to design or research centres in the Soviet Union?
- A. I visited both design and research institutes in Moscow, Donetsk and in the City of Tuymen. It is very difficult to evaluate the usefulness of what we were told during our several visits. Firstly, with respect to design, we were shown, for example, the manner in which buried and grade construction techniques are designed for permafrost areas but were not able to see those designs either being constructed or evaluate any operational problems which might have occurred as a result (we were told, however, that berms often had to be re-built annually).

As far as research is concerned, we were told that a great deal of basic permafrost research is, and has been, carried out but saw little evidence of the implementation of that research. I do not mean to imply that Soviet research programs are never translated into designs and construction techniques, because if this were the case they would not have been able to carry out the extensive development that they have of their northern resources. Obviously a great deal of useful work has been done. Some of the members of Dr. Clark's panel, as previously mentioned, attended the 2nd International Conference on Permafrost held in Yakutsk in June of 1973, and speak very highly of the amount and type of research carried out in the Soviet Union.

Q. Are there other areas in the Soviet Union in which pipelines have been installed in arctic areas containing permafrost which could be more useful from an educational point of view?

A. I am aware of two other pipelines which are located in permafrost in the Soviet Union. One runs between Norilsk and Messoyakha and is constructed above ground on piles. The other is in the Yakutsk area and is partly on piles and partly buried. Two earlier Canadian delegations visited the Norilsk-Messoyakha line and perusal of their reports did not add a great deal to our knowledge of permafrost pipeline techniques. The primary purpose of one of the groups was to note the environmental after effects. They noted little lasting environmental damage.

Another clue that strengthens my impression that we will probably not learn a great deal more from additional

visits to Russia is that I discovered during my visit that the Soviets had not constructed any test sites prior to starting designs and construction, and, apparently, now feel that test sites are required. I was questioned at length about what we had learned from our (Arctic Gas) sites, how they were laid out, pipe sizes and fluid temperatures tested, and measuring equipment utilized. I was also asked to approve the training of a Soviet engineer or research scientist for a period of 45 days at the Sans Sault Test Site. During the course of these discussions I learned that the Soviets plan to construct two pipelines and several gas well test sites in the Medverzhye area of Siberia.

During my meeting with the Soviet delegation in Calgary on March 21, I was able to confirm that the three systems described earlier are the only ones installed in the Soviet Union in permafrost, and that no pipelines have been buried there in ice-rich permafrost. In anticipation of having to do so they asked us many questions relating to our plans for foundation designs for heavy rotating machinery in areas containing ice-rich permafrost.

Incidentally, you should know that access to these areas of the Soviet Union is very difficult and normally considered out of bounds for westerners. Access is only available as a result of the "Canada-USSR Industrial Exchange Agreement on Science and Technology" organized by the Federal Department of Industry, Trade and Commerce. Part of that agreement provides for the sort of trips just described.

Q. In what manner do you think Arctic Gas and other interested Canadian groups can best keep abreast of and make use of the permafrost research carried out by the Soviets?

A. By keeping abreast of developments as described in the literature. The National Research Council of Canada publishes translations of such papers and these are available at little cost.

WITNESS RESUME

NAME

Melvin E. Carlson

PRESENT POSITION

Director of Operations and Maintenance

EDUCATION

Graduated from the University of Alberta with the degree of Bachelor of Science in Electrical Engineering.

PROFESSIONAL AFFILIATIONS

Engineering Institute of Canada

Association of Professional Engineers of Ontario and Manitoba

PROFESSIONAL EXPERIENCE

1952 - 1953:

Perforating Guns of Canada Limited, Edmonton. Oil and gas well logging engineer. Duties and responsibilities included gamma ray and neutron logs of oil and gas wells and interpretation of same for the clients' engineer.

1953 - 1956:

Imperial Oil Limited, Edmonton and Toronto Office engineer. Duties and responsibilities included project expediting engineer in the purchasing department during Interprovincial Pipeline Company's expansion program.

Office engineer in Imperial Oil Limited's standards section in Toronto developing specifications for equipment and materials.

1956 - 1975:

TransCanada PipeLines, Toronto, Ontario.

1956 - 1958: Office engineer. Duties and responsibilities included miscellaneous design and estimating and responsibility for all construction material requisition preparation covering pipeline, compressor station and sales meter station projects.

1958 - 1960: Senior engineer. Duties and responsibilities: same as above plus construction project materials control. Supervision and administration for staff of 14.

1960 - 1964: Senior engineer, construction services. Duties and responsibilities: same as above plus: estimating; three TCPL survey crews; legal survey contracts; administration of all permits required to comply with NEB regulations; TCPL standards; field proof-testing of new

pipelines including the preparation of specifications and procedures for air and hydrostatic testing of pipeline to comply with NEB regulations; witnessing and accepting field tests and the preparation of documentation required for submission to the NEB for leave to open and operate. Supervision and administration for staff of 24.

1964 - 1968: Senior engineer, pipeline design. Duties and responsibilities: same as above plus: pipeline design and drafting; pipeline construction specifications; bid document preparation; pipeline construction supervision (1965-66 only); as-built drawing preparation; TCPL representative of pipeline design committee for GLGT project.

1968 - 1971: Supervising engineer, pipeline design. Duties and responsibilities: same as above excluding construction, plus: pipeline construction planning; aerial photography contracts; member CSA Committee; aluminum Piping Code; alternative member ASA B 31.8 Code for natural gas transmission; TCPL representative ASTM corporate membership; alternate member CSA Z-184 Code for natural gas transmission. Supervision and administration for staff of 35. --

1971 - 1972: Assistant Chief Engineer, Pipeline Design and Operations. Duties and responsibilities: same as above plus: pipeline operations; gas measurement; corrosion. Supervision and administration for staff of 58.

1972 - 1974: Manager, Facilities Operation. Duties and responsibilities: compressor station and pipeline operations including managing of the technical support staff devoted entirely to the field operation of the TCPL system. These responsibilities included the following operations department sections: compressor, communications and controls, performance analysis, pipeline, gas measurement, corrosion, Victoria Square test facility.

1974 - 1975: Manager, Operations. Duties and responsibilities: same as above plus: all facets of construction supervision; commissioning and start-up of new facilities; field operation and maintenance of TCPL's transmission facilities. Supervision and administration for staff of approximately 900.

